

XX.—*Note on a Remarkable Aleyonarian, Studeria* mirabilis*
g. et sp. n.

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PLATE XVI.

A COLLECTION of Aleyonarians made by the 'Investigator' in the Indian Ocean included a specimen from the Andamans which is certainly one of the most remarkable of the many interesting representatives of this sub-class that have been discovered within recent years. It is a cup-like colony, with a large retractile polyparium. The cup is 45 mm. in height by 55 mm. in maximum diameter, and it is continued into a basal wisp (19 mm. in length), which, however, shows no attaching disk. The specimen gave indication of having been imbedded in the mud up to about the maximum diameter of the cup.

General Structure.—The most striking peculiarity of this Aleyonarian is that the whole of the polyp-bearing portion is retracted within the exceedingly substantial, densely spinose cup, the circular mouth of which is about 30 mm. in diameter, and shows the tips of numerous finger-like polyp-bearing lobes or branches. It seems quite likely that the mouth of the cup was capable of more complete closure, and, on the other hand, that the retracted polyparium was capable of considerable protrusion.

A longitudinal median section of the single specimen shows a dome-shaped fleshy centre, or thalamus, from the margins and summit of which most of the numerous finger-like polyp-bearing lobes arise. Some of them, however, are attached to the inner wall of the cup at different levels. The central dome, it should be noted, rises quite freely in the middle of the cup; its diameter is greater than half the maximum diameter of the cup. The arrangement of the polyp-bearing lobes may be compared to the distribution of carpels and stamens in the flower of some of the Rosacea, in which the former are disposed on a dome-shaped central thalamus, and the latter on several whorls on the inner wall of the "calyx-tube." Or, again, the central region of our specimen may be con-

* I have named this type in honour of Professor Th. Studer, of Bern, who has contributed so largely to our knowledge of Aleyonaria.

pared to the disk of a Composite's capitulum and the peripheral parts to the ray-florets (plate XVI. fig. 1).

There are large longitudinal canals in the central dome, separated by tough hyaline mesoglæa. Very strong muscle-bands pass down their walls, and there are others in the wall of the cup reaching almost to the margin. These longitudinal bands pass for a short distance into the wisp-like stalk and gradually disappear. Numerous well-defined transverse muscles extend between the several longitudinal bands.

The Cup.—The cortical part of the wall of the cup, which is very definite and has a thickness of about 2 mm., is extremely hard, consisting mainly of long spindles, readily visible to the naked eye (some over 5 mm. in length), arranged for the most part in longitudinal interlacing rows. On the surface many of the spindles lie exposed throughout their whole length. Towards the base of the cup the spicules increase in size, and they attain their maximum dimensions—almost 1 cm. in length—in the basal wisp. These are probably the largest Alcyonarian spicules as yet known.

The internal part of the wall of the cup, as distinguished from the hard cortex just described, is soft and muscular. It is about 9 mm. in thickness where it joins the base of the dome, and narrows gradually to the margin of the cup.

The System of Canals.—Each of the finger-like polyp-bearing lobes has a large canal, with which the cavities of the polyps communicate. These branch canals pass into the dome or the wall of the cup, as the case may be, and uniting with others form the main longitudinal canals. These are relatively large, especially at the base of the cup and below the central dome, where they are about 2·5 mm. in diameter. From this region of maximum size, they gradually taper into the wisp-like stalk. The walls of the canals bear the strong longitudinal muscle-bands, and there are very few spicules.

Polyp-bearing Lobes or Branches.—Looking down into the mouth of the cup, one sees the heads of between sixty and seventy polyp-bearing lobes or branches, but the number visible will of course depend on the degree to which the dome is contracted. Besides the branches on its summit, the central dome bears four whorls, and there are also four tiers on the wall of the cup. It should be noted, however, that the lobes do not all arise singly from the central dome, but may cohere for a distance of 2–6 mm. at their bases. Some are united in pairs; in one case seven were found to be cohering.

Polyps.—Each of the finger-like branches resembles a spike-inflorescence, and bears 150–200 close-set sessile polyps. These almost cover the surface, but without discernible arrangement. At



FIG. 1.—Longitudinal section of *Studeria mirabilis* g. et sp. n. Natural size.



FIG. 2.—The upper part of one of the digitiform polyp-bearing lobes or branches of *Studeria mirabilis* g. et sp. n. It shows the terminal polyp much larger than the others. $\times 12$.

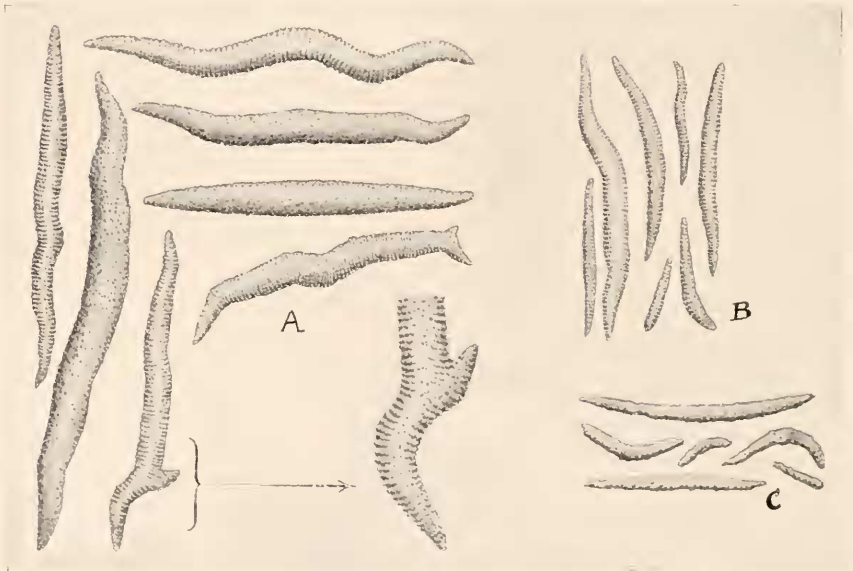


FIG. 3.—Spicules of *Studeria mirabilis*.

A. From the stalk. B. From the internal wall of the cup. C. From a polyp-bearing lobe.

the summit there is a terminal polyp which is larger than the others. In many cases a branch has a length of 15 mm. and a maximum diameter of 3 mm., but in regard to these and other measurements of soft parts it must be remembered that the whole colony has been much contracted by preservation in strong spirit (plate XVI. fig. 2.).

The polyps have almost globular calyces or verrucae, with a diameter of about 1 mm. The tentacles are in most cases completely retracted, and the summit of the calyx shows a sharply defined circular aperture. The polyps with their calyces and precise circular aperture recall those of some of the Pennatulids, such as Virgularids. On the wall of the calyx there are eight triangular points, each consisting of two to three pairs of spicules arranged *en cherron*, surmounting a collaret of several horizontal rows. In most cases, however, the projecting spindles of the cortical cœnenchyma hide the base of the calyx and may even intrude upon it. The anthocodia is very minute and is completely retractile within the globular calyx. The tentacles are short and thick, apparently without spicules, and with about half a dozen pairs of pinnules.

Spicules.—Apart from a few irregular minute forms found on the canal walls (and possibly extraneous) all the spicules are spindles. Many are huge, most are densely warted. The warts are often in close-set transverse rows, so that the spindle has a striated appearance. Many of the spindles are curved in a sinuous fashion; not a few are irregularly forked (plate XVI. fig. 3).

The following measurements were taken of the spicules, length and breadth in millimetres:—

From the stalk :	9·5 × ·534;	7 × ·51;	5·75 × ·476.
From the cortex :	5·5 × ·476;	3·5 × ·28;	1·75 × ·153.
From the inner wall of the cup :	5 × ·4;	3 × ·2;	2 × ·15.
From the canal walls :	6 × ·51;	4·25 × ·4;	2·75 × ·32.
From the polyps :	1·6 × ·112;	1·02 × ·05;	·45 × ·034;
		·17 × ·018;	·13 × ·017.

Position of Studeria.—If this type is to be referred to any of the recognised families of the Aleyonacea it must be to the Aleyoniidae. In the retractility of the whole polyparium, as well as in the mode of branching, the disposition of the polyps and their armature, it is removed from the Nephthyids and Siphonogorgids.

In certain respects, e.g. the distinct calyces into which the delicate upper parts of the polyps are retracted and the large longitudinal canals continued in part to the base of the colony,

Studeria resembles *Nidalia*, but the *Nidalia* colony is unbranched, and there are many other differences apart from *Studeria*'s retractile polyparium. In certain respects, e.g. in its huge spindles and in the finger-like lobes densely covered with polyps, *Studeria* resembles a form like *Sclerophytum polydactylum*, but the polyps are quite different in the two, and there is not in *Studeria* any hint of dimorphism. The non-retractile calyces, the mode of branching, the nature of the spiculation, and other features separate *Studeria* from *Aleyonium* and several nearly related genera. So we might review all the genera of Aleyoniidæ, but to little profit, for there is only one which can be thought of as having close affinities with our new type. That one is the genus *Paraleyonium*, established by Milne-Edwards. Milne-Edwards gave the following diagnosis of *Paraleyonium*: "Polyparium of a coriaceous tissue towards the base and there forming a cylindrical tube with spiculate walls, into the interior of which all the upper and soft part of the polyparium, including the polyps themselves, can be completely retracted."*

In his original description of *Paraleyonium*, when he called it Aleyonide,† Milne-Edwards gave a number of interesting details. He distinguished a brown firm "foot" fixed by its base, and a white, delicate, branched trunk with twigs ending in small polyps. The cavities of the polyps unite in forming longitudinal canals which are continued to the base, those which lie to the outside having their walls strengthened by numerous brown spindles. Ova are developed on lamellæ in the lower part of the canals of the trunk and fall into the cavity, accumulating further down. On the polyps there are, according to Milne-Edwards, rows of "spicules cartilagineuses brunâtres."

Wright and Studer gave the following definition of *Paraleyonium* in the 'Challenger' Report on Aleyonarians (1889):—"The colony presents two distinct portions: one, the basal portion, is dense, with firm walls; the other, the head, alone bears the polyps, and can be in part withdrawn into the basal part. The polyp-bearing portion is but feebly lobed." In his "Versuch eines Systemes der Aleyonaria"‡ Studer had suggested affinity with *Nidalia*.

Our new type *Studeria* agrees with *Paraleyonium* (1) in having the polyp-bearing portion retractile into the basal portion, (2) in the disposition of the longitudinal canals, and (3) in having very large fusiform spicules. But there the resemblance stops, and there can be no question as to the distinctiveness of the two very remarkable genera.

* Histoire Naturelle des Coralliaires, 1857, p. 129.

† Ann. Sci. Nat., ser. 2, iv. (1835) pp. 323-33 (9 figs.).

‡ Arch. Natur., liii. (1887).

The most obvious differences between *Studeria* and *Paralecyonium* may be summed up in the following contrast:—

Studeria mirabilis.

The polyps are crowded on numerous finger-like branches, which cover a central dome, and also grow out from the inner walls of the cup.

The polyps have a dense armature of spicules, forming a well-defined calyx.

The walls of the cup are very massive and hard.

The retractile polyparium is very substantial, including strong muscle-bands.

The larger spindles are very characteristic, being covered with warts in thick-set rows.

Paralecyonium.

The polyps are distant from one another, and are borne on the ends of the twigs of a loosely-branched polyparium.

The polyps have minute spicules at the base of the tentacles, but there is no calyx.

The walls of the cylindrical lower portion are not thick, and the whole is readily compressible.

The retractile polyparium is very delicate and translucent.

The spindles are much smaller, and much less warty.

It should be noted that *Studeria mirabilis* is much larger than *Paralecyonium elegans*, much more massive, with much larger and coarser spicules, and so on; but we have reason to believe that the massiveness of architecture is a specific, not a generic character. We saw in September in the Zoological Museum in Hamburg a number of un-named specimens of a form which we believe to be closely related to *Studeria*. By the courtesy of the director, Professor Kraepelin, and of Dr. Michaelsen, who has charge of the section of the museum containing Aleyonaria and the like, we were able to examine this form, and to compare it with the 'Investigator' type. The Hamburg specimens, which were collected off Formosa (Takao), agree with the 'Investigator' specimen in having a retractile polyparium, similar polyps, and the same type of huge warty spindle, but they have not the strong massive cup, nor, so far as we have seen, the same development of central dome, or of digitiform lobes. We do not wish to pursue the comparison in the meantime, since Professor Kükenthal has, we believe, undertaken to describe the un-named Aleyonarians in the Hamburg Museum. We would, however, express our conclusion that the Hamburg specimens belong, or are closely related, to the genus *Studeria*, which we have established for the 'Investigator' type. [It must be added that we exhibited, described, and named the 'Investigator' specimen in August 1907, at the Meeting of the International Congress of Zoologists at Boston. As we have heard nothing regarding the manuscript which we deposited, we have thought it necessary to record the facts afresh.]